EXHIBIT-A

DRAWINGS AS AMENDED

FIG. 10A GRAPH.ASC

```
100      PRINT: PRINT: PRINT "FILE: GRAPH.ASC"
110      CLEAR
1940     R%=INP (236): S%=R% AND 1: IF S%=1 THEN 1940      'LOCKUP
ON VERT.SYNC=1
1980     R%=INP (236): S%=R% AND 16: IF S%=0 THEN 1940     'CHECK FIELD
1990     OUT 236,64        'INITIALIZE GRAPHICS GENERATOR
1992     R%=INP (236): S%=R% AND 1
1993     IF S%=0 THEN 1992        'LOCKUP ON VERT.SYNC=0
1994     OUT 236,0                'COMMAND LOAD, RUN-BAR
1995        OUT 238, 246: OUT 237, 0: OUT 236,128: OUT 236,0
'X-ROW MSH
1996        OUT 238, 247: OUT 237, 0: OUT 236,128: OUT 236,0
'X-ROW LSH
1997        OUT 238,242: OUT 237, 0:  OUT 236,128: OUT 236,0
'X-PIXEL SLOPE MSH
1998        OUT 238,245: OUT 237, 0:  OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE MSH
1999        OUT 238,248: OUT 237, 0:  OUT 236,128: OUT 236,0
'X-ROW SLOPE MSH
2000        OUT 238,251: OUT 237, 0:  OUT 236,128: OUT 236,0
'Y-ROW SLOPE MSH
2001        OUT 238,244: OUT 237, 0:  OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE LSH
2002        OUT 238,240: OUT 237, 0:  OUT 236,128: OUT 236,0
'X-ROW SLOPE LSH
2003        OUT 238,243: OUT 237, 255:  OUT 236,128: OUT 236,0
'X-PIXEL SLOPE LSH
2004        OUT 238,241: OUT 237, 255:  OUT 236,128: OUT 236,0
'Y-ROW SLOPE LSH
2005     OUT 236,80   'COMMAND RUN, LOAD-BAR ;PULSE-1 BRACKETING
COMPUTATION PERIOD
2006     R%=INP (236): S%=R% AND 1: IF S%=1 THEN 2006      'LOCKUP
ON VERT.SYNC=1
2007     R%=INP (236): S%=R% AND 16: IF S%=0 THEN 2006     'CHECK FIELD
2060     'ITERATIVE PROCESSING
2100     OUT 236,64
2140     'RESYNCHRONIZATION AND FIELD CONTROL PROCESSOR
2220     R%=INP (236): S%=R% AND 1
2300     IF S%=0 THEN 2220          'LOCKUP ON VERT.SYNC=0
3060            'INTERLACED SCAN CALCULATIONS
3100            'INPUT BYTE    128 064 032 016 008 004 002 001
3140            '                     F2     F1      LS      FS
3180     OUT 236,0                      'COMMAND LOAD, RUN-BAR
3220     R%=INP (236): S%=R% AND 16: IF S%=0 THEN 3540 ELSE 3260
'CHECK FIELD
3260                     'FIELD-2
3300        'OUTPUT  POSITION PARAMETERS
3340        OUT 238, 249: OUT 237, 0: OUT 236,128: OUT 236,0
'Y-ROW MSH
3380        OUT 238, 250: OUT 237, 4: OUT 236,128: OUT 236,0
'Y-ROW LSH
3500     GOTO 4140
```

FIG. 10B   GRAPH.ASC

```
3540                         'FIELD-1
3580          'OUTPUT  POSITION PARAMETERS
3620            OUT 238, 249: OUT 237, 0: OUT 236,128: OUT 236,0
'Y-ROW MSH
3660            OUT 238, 250: OUT 237, 0: OUT 236,128: OUT 236,0
'Y-ROW LSH
4140      OUT 236,80   'COMMAND RUN, LOAD-BAR ;PULSE-1 BRACKETING
COMPUTATION PERIOD
4220      GOTO 2060                  'LOOP BACK FOR NEXT FIELD
20000     END
```

FIG. 11A   LD.ASC

```
50        PRINT "ACCESSED "LD" FILE TO LOAD IMAGE MEMORY:
REV.5/15/84 09:00"
55        INPUT "MURPHY (M) OR CAMILLE (C)";K200$
100       INT1%=0: D%=0: K8%=1: K9%=1
112       PRINT: PRINT "****************************************"
114       PRINT "    SELECT OPERATION"
116       PRINT "****************************************": PRINT
118       PRINT "RETURN TO OPERATING SYSTEM ..................... 0"
120       PRINT "SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY ... 1"
122       PRINT "SELECT IMAGE TO BE LOADED INTO IMAGE MEMORY"
124       PRINT "        CONCENTRIC SQUARE FRAMES ................. 2"
126       PRINT "        RECTANGLES AND LINES ..................... 3"
128       PRINT "        SPIRALS ................................. 4"
130       PRINT "        VIEWPORT COORDINATE SYMBOLS ............. 5"
132       PRINT "        PATTERN #6 .............................. 6"
134       PRINT "        PATTERN #7 .............................. 7"
136       PRINT "        SQUARE PATTERN .......................... 8"
138       PRINT "        SQUARE FRAMES ........................... 9"
140       PRINT "        PERIPHERAL SQUARES ..................... 10"
141       PRINT "        PERIPHERAL TRIANGLES ................... 11"
142       PRINT "        HOUSE ................................. 12"
151       INPUT "                              SELECT OPERATION
NUMBER";A20%
152       IF A20%<13 THEN 155
153       PRINT "****************": PRINT "IMPROPER SELECTION":
PRINT "****************"
154       GOTO 112
155       IF A20%>0 THEN 158
156               SYSTEM
158       ON A20% GOSUB 170, 4400, 4530, 5500, 4500, 7500, 8500,
9000, 9040, 9180, 9280, 11070
159       GOTO 112
170       PRINT: PRINT "****************************************"
171       PRINT "    SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY"
172       PRINT "****************************************": PRINT
173       PRINT "    RETURN TO MAIN MENU ......................... 0"
174       PRINT "    SELECT RECTANGULAR IMAGE MEMORY PATTERN"
180       PRINT "        HORIZONTAL BARS"
200       PRINT "            3-2-2 WIDTH BARS, INTENSITY VARATIONS . 1"
220       PRINT "            1-1-1 WIDTH BARS, MAXIMUM INTENSITY ... 2"
240       PRINT "            LINEAR COUNT, ALL COLOR COMBINATIONS .. 8"
260       PRINT "        SOLID SINGLE COLORED IMAGES"
265       PRINT "            RECTANGLE ............................ 3"
270       PRINT "            BACKGROUND ........................... 4"
400       PRINT "        CHECKERBOARD"
420       PRINT "            4-COLORS ............................. 6"
440       PRINT "            2-COLORS ............................. 7"
442       PRINT "        VARIABLE SINGLE COLORS"
443       PRINT "            GREEN SAWTOOTH ...................... 10"
460       PRINT "        CENTER ELEMENT"
480       PRINT "            9-PIXEL SQUARE ...................... 11"
482       PRINT "        SELECT SLOPING LINE ..................... 12"
484       INPUT "                              SELECT PATTERN
NUMBER";A5%
486       IF A5%>0 THEN 502
```

FIG. 11B LD.ASC

```
500                 RETURN
502       IF A5%<13 THEN 520
503       PRINT "***************": PRINT "IMPROPER SELECTION":
PRINT "***************"
504       GOTO 170
520       IF A5%=3 OR A5%=4 OR A5%=12 THEN 523 ELSE 535
523       PRINT "COLOR CODE"
524       PRINT "      BLACK ........ 0"
526       PRINT "      GREEN ........ 1  TO   7"
527       PRINT "      RED .......... 8, 16, 24"
528       PRINT "      BLUE ......... 32, 64, 96"
529       INPUT "                              SELECT COLOR
CODE SUM";INT1%
530       IF INT1%<128 THEN 535
531       PRINT:PRINT "************************************"
532       PRINT "IMPROPER COLOR CODE; ENTER COLOR CODE AGAIN"
533       PRINT "************************************":PRINT
534       GOTO 523
535       IF A5%=11 THEN 2040
540       IF A5%=6 OR A5%=7 GOTO 560 ELSE 570
560               INPUT "CHECKERBOARD RESOLUTION, PIXELS PER
SIDE";A6%
570       IF A5%=4 THEN 575 ELSE 580
575             A5%=3: XB%=0: YB%=0: XE%=511: YE%=511: GOTO 623
580       INPUT "    START PIXEL COORDINATE";XB%,YB%
620       INPUT "    STOP  PIXEL COORDINATE";XE%,YE%
623       GOSUB 630
624       GOTO 170
630       '*************************************************
632       'SUBROUTINE TO OVERLAY A RECTANGLE
635             XB%=(XB%+1)*8:  YB%=(YB%+1)*8
640             XE%=(XE%+1)*8:  YE%=(YE%+1)*8
642'      IF XB%=>8 AND XB%<XE% AND XE%=>8 AND XB%=<512*8 AND
XE%=<512*8 THEN 643 ELSE 656
643'      IF YB%=>8 AND YB%<YE% AND YE%=>8 AND YB%=<512*8 AND
YE%=<512*8 THEN 660 ELSE 656
656'      PRINT:PRINT "*************************************"
657'      PRINT "IMPROPER PIXEL COORDINATES, ENTER PIXEL
COORDINATES AGAIN"
658'      PRINT "*************************************":PRINT
659'      GOTO 580
660'      PRINT: PRINT "*************************************"
665'      PRINT "          IMAGE MEMORY IS BEING LOADED"   'PRINT
"ROW","COLOR INTENSITY"
666'      PRINT "*************************************"; PRINT
667       IF A5%=12 THEN 4200
690       XPS%=256: YPS%=0: XRP%=XB%-8
695       GOSUB 3000
700       FOR OUTLP1%=YB% TO YE% STEP 8          'ROW LOOP
710       YRP%=OUTLP1%-8          'UPDATE TO NEXT ROW
711       XRP%=XB%-8
712       GOSUB 3000              'LOAD IMP REGISTERS
948       OUT 236,32              'SET SEQUENTIAL LOAD COMMAND
1230      'DETERMINE INTENSITY (INT1%)
1240      ON A5% GOTO
```

```
1260,1460,1720,1250,1250,1920,1980,1800,1250,1820
1250      PRINT "*************": PRINT "SELECT A DIFFERENT IMAGE":
PRINT "*************"
1260      IF D%<8 THEN 1340          'IMAGE PATTERN 1
1280      IF D%<32 THEN 1380         ' !-64-32-!-16-08-!-04-02-01-!
1300      IF D%<128 THEN 1420        ' !  BLUE !  RED !  GREEN   !
1320      INT1%=0: D%=0: GOTO 1980
1340      INT1%=D% AND 7
1360            D%=D%+1: GOTO 1980
1380      INT1%=D% AND 24
1400          D%=D%+8: GOTO 1980
1420      INT1%=D% AND 96
1440            D%=D%+32: GOTO 1980
1460      A3%=FIX ((OUTLP1%-8)/8)                     'IMAGE PATTERN 2
1480      GOSUB 1520
1500      GOTO 1980
1520      '***** SUBROUTINE, MAXIMUM COLOR ******************
1540            A4%=A3% AND 3
1560            A7%=A4%+1
1580            ON A7% GOTO 1600,1620,1640,1660
1600            INT1%=0: GOTO 1680
1620            INT1%=7: GOTO 1680
1640            INT1%=24: GOTO 1680
1660            INT1%=96
1680      RETURN
1700 '*********************************************************
1720            INT1%=INT1%: GOTO 1980            'PATTERN-3, SOLID
COLOR
1800            K2%=(OUTLP1%-8)/8: INT1%= K2% AND 127: GOTO 1980
'PATTERN 8, LINEAR COUNT
1820      INT1%=K8%: K10%=K9% AND 1
1840      IF K10%=0 THEN 1920
1860            K8%=K8%+1                         'UPCOUNT, ADD
1880            IF K8%<8 THEN 1980
1900            K9%=K9%+1: K8%=6: GOTO 1980              'CHANGE
COUNT DIRECTION
1920            K8%=K8%-1                         'DOWNCOUNT, SUBT
1940            IF K8%>0 THEN 1980
1960            K9%=K9%+1: K8%=2: GOTO 1980
'CHANGE COUNT DIRECTION
1980      SP1%=INIT1% AND 1: SP2%= INIT1% AND 3: SP3%=INT1% AND 7:
SP4%=INT1% AND 15: SP5%=INT1% AND 31: SP6%=INT1% AND 63:
SP7%=INT1% AND 127
1985      OUT 238, 252: OUT 237, SP1%: OUT 237, SP2%: OUT 237,
SP3%: OUT 237, SP4%: OUT 237,SP5%: OUT 237,SP6%: OUT 237, SP7%:
OUT 237, INT1%  'DATA TO LOAD IN IMAGE MEMORY
1991      ON A5% GOTO
1994,1994,1994,1994,1994,1992,1993,1994,1994,1994
1992      A3%=FIX((2*OUTLP1%+INLP1%)/A6%): GOSUB 1520: GOTO 1994
1993      A3%=FIX((2*OUTLP1%+2*INLP1%)/A6%): GOSUB 1520: GOTO 1994
1994      FOR INLP1%=XB% TO XE% STEP 8            'PIXEL LOOP
1995      OUT 236,160: OUT 236,32
1996      NEXT INLP1%
1997      OUT 237, SP7%: OUT 237, SP6%: OUT 237, SP5%: OUT 237,
SP4%: OUT 237,SP3%: OUT 237,SP2%: OUT 237, SP1%: OUT 237,0
```

FIG. 11D LD.ASC

```
'DATA TO LOAD IN IMAGE MEMORY
1999    IF K200$="M" THEN
2000    A8%=INP (93): A8%=A8% AND 2: IF A8%=0 THEN 2009
'OPERATOR RESET
2001    A8%=INP (92): GOTO 2006
2002    A8%=INP (1): A8%=A8% AND 2: IF A8%=0 THEN 2009
'OPERATOR RESET
2003    A8%=INP (0)
2006        A9%=A8% XOR 155: IF A9%=0 THEN 100    'ESCAPE TO MENU
2007        A9%=A8% XOR 127: IF A9%=0 THEN 2008 ELSE 2009
'DELETE TO SYSTEM
2008            SYSTEM
2009    NEXT OUTLP1%
2010'   PRINT CHR$(7); :PRINT "MEMORY LOAD COMPLETE"
2020    RETURN              'RETURN TO OVERLAY MENU
2040    'PATTERN 11
2060    INT1%=7: K17%=(256-3)*8: K18%=(256+3)*8
2080    FOR OUTLP1%=K17% TO K18% STEP 8
2100        OUT 238, 249                    'Y-ROW MSH
2120            C%=FIX(OUTLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2140        OUT 238, 250                    'Y-ROW LSH
2160            C%=OUTLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2180    FOR INLP1%=K17% TO K18% STEP 8            'PIXEL LOOP
2200        OUT 238, 246                    'X-ROW MSH
2220            C%=FIX(INLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2240        OUT 238, 247                    'X-ROW LSH
2260            C%=INLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2280        OUT 238, 252                    'DATA TO LOAD IN IMAGE MEMORY
2300    OUT 237, INT1%: OUT 236,129: OUT 236,1
2320    NEXT INLP1%
2340    NEXT OUTLP1%
2360        OUTLP1%=(256-5)*8
2380        OUT 238, 249                    'Y-ROW MSH
2400            C%=FIX(OUTLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2420        OUT 238, 250                    'Y-ROW LSH
2440            C%=OUTLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2460    K17%=(256-6)*8: K18%=(256)*8
2480    FOR INLP1%=K17% TO K18% STEP 8            'PIXEL LOOP
2500        OUT 238, 246                    'X-ROW MSH
2520            C%=FIX(INLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2540        OUT 238, 247                    'X-ROW LSH
2560            C%=INLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2580        OUT 238, 252                    'DATA TO LOAD IN IMAGE MEMORY
2600    OUT 237, INT1%: OUT 236,129: OUT 236,1
2620    NEXT INLP1%
2640    GOTO 2000
3000    '************ SUBROUTINE TO OUTPUT  POSITION AND SLOPE PARAMETE
3001        OUT 236,0    'D0A5 TURNED OFF TO DISABLE SEQUENCING
DURING LOADING OF REGISTERS
3002        'SLOPE SCALE FACTOR=256*PIXELS/STEP
3003        'POSITION SCALE FACTOR =8*PIXELS
3004    XPSM%=FIX(XPS%/64):     XPSL%=XPS% AND 63
3005        OUT 238,242: OUT 237,XPSM%: OUT 236,128: OUT 236,0
'X-PIXEL SLOPE MSH
3006            OUT 238,243: OUT 237,XPSL%: OUT 236,128: OUT 236,0
```

FIG. 11E   LD.ASC

```
'X-PIXEL SLOPE LSH
3007     YPSM%=FIX(YPS%/64):     YPSL%=YPS% AND 63
3008          OUT 238,245: OUT 237,YPSM%: OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE MSH
3009          OUT 238,244: OUT 237,YPSL%: OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE LSH
3010'    OUT 236, 0          'SUBROUTINE ENTRY POINT
3020     XRPM%=FIX(XRP%/64):     XRPL%=XRP% AND 63
3091     YRPM%=FIX(YRP%/64):     YRPL%=YRP% AND 63
'FORMAT POSITION OUTPUTS
3095          OUT 238,249: OUT 237,YRPM%: OUT 236,128: OUT 236,0
'Y-ROW MSH (Y-PIXEL MSH)
3096          OUT 238,250: OUT 237,YRPL%: OUT 236,128: OUT 236,0
'Y-ROW LSH (Y-PIXEL LSH)
3097          OUT 238,246: OUT 237,XRPM%: OUT 236,128: OUT 236,0
'X-ROW MSH (X-PIXEL MSH)
3098          OUT 238,247: OUT 237,XRPL%: OUT 236,128: OUT 236,0
'X-ROW LSH (X-PIXEL LSH)
3690     RETURN
4200     '****************************************************
4210     'DRAW A LINE
4220     DX=XE%-XB%: DY=YE%-YB%
4221     DTG=0
4222     IF DX=0 AND DY=0 THEN 4228
4224     IF ABS(DX)>ABS(DY) THEN 4227
4226     YPS%=(DY*256)/ABS(DY): XPS%=(DX*256)/ABS(DY):
DTG=ABS(DY): GOTO 4228
4227     YPS%=(DY*256)/ABS(DX): XPS%=(DX*256)/ABS(DX):
DTG=ABS(DX)
4228     XRP%=XB%-8: YRP%=YB%-8
4255     GOSUB 3000
4270     OUT 238, 252: OUT 237, INT1%           'DATA TO LOAD IN
IMAGE MEMORY
4273     OUT 236,32             'SET SEQUENTIAL LOAD COMMAND
4274     DTG=DTG+8
4276     IF DTG>8 THEN 4288
4287     OUT 236,160: OUT 236,32: GOTO 4305
4288     FOR INLP1=8 TO DTG STEP 8             'PIXEL LOOP
4290     OUT 236,160: OUT 236,32
4300     NEXT INLP1
4305     OUT 236,0             'RESET SEQUENTIAL LOAD COMMAND
4350     RETURN
4400     '****************************************************
4410     INIT1%=7: XB%=225: YB%=255: YPS%=0: XPS%=256
4420     FOR OUTLP1%=1 TO 10
4435     XRP%=XB%: YRP%=YB%
4437     XB%=XB%-1: YB%=YB%+1
4440     DX=2*OUTLP1%+1
4470     GOSUB 3000
4480     OUT 238, 252: OUT 237, INT1%           'DATA TO LOAD IN
IMAGE MEMORY
4484     OUT 236,32             'SET SEQUENTIAL LOAD COMMAND
4488     FOR INLP1=8 TO DX STEP 8               'PIXEL LOOP
4492     OUT 236,160: OUT 236,32
4493     NEXT INLP1
```

FIG. 11F   LD.ASC

```
4495     OUT 236,0                      'RESET SEQUENTIAL LOAD COMMAND
4496     NEXT OUTLP1%
4497     RETURN
4500     '********************************************************
4510     'BLACK BACKGROUND WITH COORDINATE SYMBOLS
4520'    A5%=3:   INT1%=0:   XB%=0:      YB%=0:    XE%=511:  YE%=511:
GOSUB 630
4522     A5%=12:  INT1%=3:   XB%=0:      YB%=0:    XE%=0:    YE%=511:
GOSUB 630
4523     A5%=12:  INT1%=3:   XB%=0:      YB%=0:    XE%=511:  YE%=0:
GOSUB 630
4524     A5%=3:   INT1%=3:   XB%=252:    YB%=252:  XE%=258:  YE%=258:
GOSUB 630
4525     A5%=3:   INT1%=3:   XB%=250:    YB%=250:  XE%=260:  YE%=260:
GOSUB 630
4526     A5%=3:   INT1%=3:   XB%=0:      YB%=0:    XE%=10:   YE%=10:
GOSUB 630
4527     RETURN
4530     '********************************************************
4531     'RECTANGLE AND LINE PATTERN
4540     A5%=3:   INT1%=24:  XB%=100:    YB%=400:  XE%=200:  YE%=500:
GOSUB 630
4550     A5%=1:              XB%=400:    YB%=100:  XE%=500:  YE%=200:
GOSUB 630
4555     A5%=10:             XB%=100:    YB%=100:  XE%=200:  YE%=200:
GOSUB 630
4556     A5%=12:  INT1%=24:  XB%=0:      YB%=0:    XE%=511:  YE%=511:
GOSUB 630
4557     A5%=12:  INT1%=24:  XB%=0:      YB%=511:  XE%=511:  YE%=0:
GOSUB 630
4561     RETURN
5500     '********************************************************
5510     'SPIRAL LINES
5535     A5%=12:  INT1%=24:  XB%=0:      YB%=0:    XE%=10000:
YE%=200:    GOSUB 630
5540     A5%=12:  INT1%=96:  XB%=0:      YB%=511:  XE%=30000:
YE%=200:    GOSUB 630
5561     RETURN
6500     '********************************************************
6520     A5%=3:   INT1%=96:  XB%=0:      YB%=0:    XE%=511:  YE%=511:
GOSUB 630
6530     A5%=3:   INT1%=24:  XB%=100:    YB%=500:  XE%=200:  YE%=400:
GOSUB 630
6550     A5%=1:              XB%=500:    YB%=100:  XE%=400:  YE%=200:
GOSUB 630
6560     A5%=10:             XB%=100:    YB%=100:  XE%=200:  YE%=200:
GOSUB 630
6561     RETURN
7500     '********************************************************
7520     A5%=3:   INT1%=96:  XB%=0:      YB%=0:    XE%=511:  YE%=511:
GOSUB 630
7530     A5%=3:   INT1%=24:  XB%=100:    YB%=500:  XE%=200:  YE%=400:
GOSUB 630
7535     A5%=12:  INT1%=24:  XB%=0:      YB%=0:    XE%=511:  YE%=511:
GOSUB 630
```

FIG. 11G LD.ASC

```
7540      A5%=12: INT1%=24:  XB%=0:     YB%=511:  XE%=511:  YE%=0:
GOSUB 630
7550      A5%=1:             XB%=500:   YB%=100:  XE%=400:  YE%=200:
GOSUB 630
7560      A5%=10:            XB%=100:   YB%=100:  XE%=200:  YE%=200:
GOSUB 630
7561      RETURN
8500      '******************************************************
8520      A5%=3:  INT1%=96:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
8530      A5%=3:  INT1%=24:  XB%=100:   YB%=500:  XE%=200:  YE%=400:
GOSUB 630
8535      A5%=12: INT1%=24:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
8540      A5%=12: INT1%=24:  XB%=0:     YB%=511:  XE%=511:  YE%=0:
GOSUB 630
8550      A5%=1:             XB%=500:   YB%=100:  XE%=400:  YE%=200:
GOSUB 630
8560      A5%=10:            XB%=100:   YB%=100:  XE%=200:  YE%=200:
GOSUB 630
8561      RETURN
9000      '******************************************************
9001      A5%=3:  INT1%=7:   XB%=128:   YB%=128:  XE%=256:  YE%=256:
GOSUB 630
9010      A5%=3:  INT1%=16:  XB%=256:   YB%=128:  XE%=384:  YE%=256:
GOSUB 630
9020      A5%=3:  INT1%=96:  XB%=256:   YB%=256:  XE%=384:  YE%=384:
GOSUB 630
9030      A5%=3:  INT1%=24:  XB%=128:   YB%=256:  XE%=256:  YE%=386:
GOSUB 630
9031      RETURN
9032      '******************************************************
9040      A5%=3:  INT1%=32:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
9050      A5%=3:  INT1%=7:   XB%=104:   YB%=104:  XE%=127:  YE%=407:
GOSUB 630
9060      A5%=3:  INT1%=7:   XB%=104:   YB%=104:  XE%=407:  YE%=127:
GOSUB 630
9070      A5%=3:  INT1%=7:   XB%=104:   YB%=384:  XE%=407:  YE%=407:
GOSUB 630
9080      A5%=3:  INT1%=7:   XB%=384:   YB%=104:  XE%=407:  YE%=407:
GOSUB 630
9090      A5%=3:  INT1%=24:  XB%=150:   YB%=150:  XE%=173:  YE%=361:
GOSUB 630
9100      A5%=3:  INT1%=24:  XB%=150:   YB%=150:  XE%=361:  YE%=173:
GOSUB 630
9110      A5%=3:  INT1%=24:  XB%=150:   YB%=338:  XE%=361:  YE%=361:
GOSUB 630
9120      A5%=3:  INT1%=24:  XB%=338:   YB%=150:  XE%=361:  YE%=361:
GOSUB 630
9130      A5%=3:  INT1%=96:  XB%=196:   YB%=196:  XE%=219:  YE%=315:
GOSUB 630
9140      A5%=3:  INT1%=96:  XB%=196:   YB%=196:  XE%=315:  YE%=219:
GOSUB 630
9150      A5%=3:  INT1%=96:  XB%=196:   YB%=292:  XE%=315:  YE%=315:
```

FIG. 11H   LD.ASC

```
GOSUB 630
9160    A5%=3:   INT1%=96:   XB%=292:   YB%=196:   XE%=315:   YE%=315:
GOSUB 630
9170    A5%=3:   INT1%=7:    XB%=242:   YB%=242:   XE%=269:   YE%=269:
GOSUB 630
9171    RETURN
9172    '*******************************************************
9180    A5%=3:   INT1%=96:   XB%=0:     YB%=0:     XE%=511:   YE%=511:
GOSUB 630
9190    A5%=1:                XB%=96:    YB%=96:    XE%=159:   YE%=159:
GOSUB 630
9200    A5%=1:                XB%=352:   YB%=352:   XE%=415:   YE%=415:
GOSUB 630
9210    A5%=10:               XB%=96:    YB%=352:   XE%=159:   YE%=415:
GOSUB 630
9220    A5%=10:               XB%=352:   YB%=96:    XE%=415:   YE%=159:
GOSUB 630
9230    A5%=3:   INT1%=24:   XB%=224:   YB%=224:   XE%=287:   YE%=287:
GOSUB 630
9240    A5%=12:  INT1%=7:    XB%=159:   YB%=159:   XE%=224:   YE%=224:
GOSUB 630
9250    A5%=12:  INT1%=7:    XB%=287:   YB%=287:   XE%=352:   YE%=352:
GOSUB 630
9260    A5%=12:  INT1%=7:    XB%=159:   YB%=352:   XE%=224:   YE%=287:
GOSUB 630
9270    A5%=12:  INT1%=7:    XB%=287:   YB%=224:   XE%=352:   YE%=159:
GOSUB 630
9271    RETURN
9272    '*******************************************************
9280    A5%=3:   INT1%=96:   XB%=0:     YB%=0:     XE%=511:   YE%=511:
GOSUB 630
9300    A5%=12:  INT1%=7:    XB%=5:     YB%=6:     XE%=252:   YE%=253:
GOSUB 630
9310    A5%=12:  INT1%=7:    XB%=259:   YB%=260:   XE%=506:   YE%=507:
GOSUB 630
9320    A5%=12:  INT1%=7:    XB%=5:     YB%=507:   XE%=252:   YE%=260:
GOSUB 630
9330    A5%=12:  INT1%=7:    XB%=259:   YB%=253:   XE%=506:   YE%=6:
GOSUB 630
9340    A5%=12:  INT1%=96:   XB%=5:     YB%=5:     XE%=252:   YE%=252:
GOSUB 630
9350    A5%=12:  INT1%=96:   XB%=259:   YB%=259:   XE%=506:   YE%=506:
GOSUB 630
9360    A5%=12:  INT1%=96:   XB%=5:     YB%=506:   XE%=252:   YE%=259:
GOSUB 630
9370    A5%=12:  INT1%=96:   XB%=259:   YB%=252:   XE%=506:   YE%=5:
GOSUB 630
9380    A5%=12:  INT1%=24:   XB%=5:     YB%=4:     XE%=252:   YE%=251:
GOSUB 630
9390    A5%=12:  INT1%=24:   XB%=259:   YB%=258:   XE%=506:   YE%=505:
GOSUB 630
9400    A5%=12:  INT1%=24:   XB%=5:     YB%=505:   XE%=252:   YE%=258:
GOSUB 630
9410    A5%=12:  INT1%=24:   XB%=259:   YB%=251:   XE%=506:   YE%=4:
GOSUB 630
```

FIG. 11I   LD.ASC

```
9420    A5%=3:   INT1%=7:    XB%=0:     YB%=0:     XE%=511:   YE%=0:
GOSUB 630
9430    A5%=3:   INT1%=7:    XB%=0:     YB%=0:     XE%=0:     YE%=511:
GOSUB 630
9440    A5%=3:   INT1%=7:    XB%=511:   YB%=0:     XE%=511:   YE%=511:
GOSUB 630
9450    A5%=3:   INT1%=7:    XB%=0:     YB%=511:   XE%=511:   YE%=511:
GOSUB 630
9460    A5%=3:   INT1%=96:   XB%=1:     YB%=1:     XE%=510:   YE%=1:
GOSUB 630
9470    A5%=3:   INT1%=96:   XB%=1:     YB%=1:     XE%=1:     YE%=510:
GOSUB 630
9480    A5%=3:   INT1%=96:   XB%=510:   YB%=1:     XE%=510:   YE%=510:
GOSUB 630
9490    A5%=3:   INT1%=96:   XB%=1:     YB%=510:   XE%=510:   YE%=510:
GOSUB 630
9500    A5%=3:   INT1%=24:   XB%=2:     YB%=2:     XE%=509:   YE%=2:
GOSUB 630
9510    A5%=3:   INT1%=24:   XB%=2:     YB%=2:     XE%=2:     YE%=509:
GOSUB 630
9520    A5%=3:   INT1%=24:   XB%=509:   YB%=2:     XE%=509:   YE%=509:
GOSUB 630
9530    A5%=3:   INT1%=24:   XB%=2:     YB%=509:   XE%=509:   YE%=509:
GOSUB 630
9540    A5%=3:   INT1%=7:    XB%=3:     YB%=3:     XE%=508:   YE%=3:
GOSUB 630
9550    A5%=3:   INT1%=7:    XB%=3:     YB%=3:     XE%=3:     YE%=508:
GOSUB 630
9560    A5%=3:   INT1%=7:    XB%=508:   YB%=3:     XE%=508:   YE%=508:
GOSUB 630
9570    A5%=3:   INT1%=7:    XB%=3:     YB%=508:   XE%=508:   YE%=508:
GOSUB 630
9580    A5%=3:   INT1%=96:   XB%=4:     YB%=4:     XE%=507:   YE%=4:
GOSUB 630
9590    A5%=3:   INT1%=96:   XB%=4:     YB%=4:     XE%=4:     YE%=507:
GOSUB 630
9600    A5%=3:   INT1%=96:   XB%=507:   YB%=4:     XE%=507:   YE%=507:
GOSUB 630
9610    A5%=3:   INT1%=96:   XB%=4:     YB%=507:   XE%=507:   YE%=507:
GOSUB 630
9620    A5%=3:   INT1%=24:   XB%=5:     YB%=5:     XE%=506:   YE%=5:
GOSUB 630
9630    A5%=3:   INT1%=24:   XB%=5:     YB%=5:     XE%=5:     YE%=506:
GOSUB 630
9640    A5%=3:   INT1%=24:   XB%=506:   YB%=5:     XE%=506:   YE%=506:
GOSUB 630
9650    A5%=3:   INT1%=24:   XB%=5:     YB%=506:   XE%=506:   YE%=506:
GOSUB 630
9660    A5%=12:  INT1%=7:    XB%=192:   YB%=128:   XE%=319:   YE%=128:
GOSUB 630
9670    A5%=12:  INT1%=96:   XB%=193:   YB%=129:   XE%=318:   YE%=129:
GOSUB 630
9680    A5%=12:  INT1%=24:   XB%=194:   YB%=130:   XE%=317:   YE%=130:
GOSUB 630
9690    A5%=12:  INT1%=7:    XB%=200:   YB%=136:   XE%=311:   YE%=136:
```

FIG. 11J LD.ASC

```
GOSUB 630
9700     A5%=12:  INT1%=96:   XB%=201:  YB%=137:  XE%=310:  YE%=137:
GOSUB 630
9710     A5%=12:  INT1%=24:   XB%=202:  YB%=138:  XE%=309:  YE%=138:
GOSUB 630
9720     A5%=12:  INT1%=7:    XB%=208:  YB%=144:  XE%=303:  YE%=144:
GOSUB 630
9730     A5%=12:  INT1%=96:   XB%=209:  YB%=145:  XE%=302:  YE%=145:
GOSUB 630
9740     A5%=12:  INT1%=24:   XB%=210:  YB%=146:  XE%=301:  YE%=146:
GOSUB 630
9750     A5%=12:  INT1%=7:    XB%=216:  YB%=152:  XE%=295:  YE%=152:
GOSUB 630
9760     A5%=12:  INT1%=96:   XB%=217:  YB%=153:  XE%=294:  YE%=153:
GOSUB 630
9770     A5%=12:  INT1%=24:   XB%=218:  YB%=154:  XE%=293:  YE%=154:
GOSUB 630
9780     A5%=12:  INT1%=7:    XB%=224:  YB%=160:  XE%=287:  YE%=160:
GOSUB 630
9790     A5%=12:  INT1%=96:   XB%=225:  YB%=161:  XE%=286:  YE%=161:
GOSUB 630
9800     A5%=12:  INT1%=24:   XB%=226:  YB%=162:  XE%=285:  YE%=162:
GOSUB 630
9810     A5%=12:  INT1%=7:    XB%=232:  YB%=168:  XE%=279:  YE%=168:
GOSUB 630
9820     A5%=12:  INT1%=96:   XB%=233:  YB%=169:  XE%=278:  YE%=169:
GOSUB 630
9830     A5%=12:  INT1%=24:   XB%=234:  YB%=170:  XE%=277:  YE%=170:
GOSUB 630
9840     A5%=12:  INT1%=7:    XB%=240:  YB%=176:  XE%=271:  YE%=176:
GOSUB 630
9850     A5%=12:  INT1%=96:   XB%=241:  YB%=177:  XE%=270:  YE%=177:
GOSUB 630
9860     A5%=12:  INT1%=24:   XB%=242:  YB%=178:  XE%=269:  YE%=178:
GOSUB 630
9870     A5%=12:  INT1%=7:    XB%=248:  YB%=184:  XE%=263:  YE%=184:
GOSUB 630
9890     A5%=12:  INT1%=96:   XB%=249:  YB%=185:  XE%=262:  YE%=185:
GOSUB 630
9900     A5%=12:  INT1%=24:   XB%=250:  YB%=186:  XE%=261:  YE%=186:
GOSUB 630
9910     A5%=3:   INT1%=7:    XB%=255:  YB%=192:  XE%=256:  YE%=192:
GOSUB 630
9920     A5%=3:   INT1%=7:    XB%=255:  YB%=420:  XE%=256:  YE%=420:
GOSUB 630
9930     A5%=12:  INT1%=7:    XB%=250:  YB%=426:  XE%=261:  YE%=426:
GOSUB 630
9940     A5%=12:  INT1%=96:   XB%=249:  YB%=427:  XE%=262:  YE%=427:
GOSUB 630
9950     A5%=12:  INT1%=24:   XB%=248:  YB%=428:  XE%=263:  YE%=428:
GOSUB 630
9960     A5%=12:  INT1%=7:    XB%=242:  YB%=434:  XE%=269:  YE%=434:
GOSUB 630
9970     A5%=12:  INT1%=96:   XB%=241:  YB%=435:  XE%=270:  YE%=435:
GOSUB 630
```

FIG. 11K   LD.ASC

```
9980     A5%=12: INT1%=24:  XB%=240:  YB%=436:  XE%=271:  YE%=436:
GOSUB 630
9990     A5%=12: INT1%=7:   XB%=234:  YB%=442:  XE%=277:  YE%=442:
GOSUB 630
10000    A5%=12: INT1%=96:  XB%=233:  YB%=443:  XE%=278:  YE%=443:
GOSUB 630
10010    A5%=12: INT1%=24:  XB%=232:  YB%=444:  XE%=279:  YE%=444:
GOSUB 630
10020    A5%=12: INT1%=7:   XB%=226:  YB%=450:  XE%=285:  YE%=450:
GOSUB 630
10030    A5%=12: INT1%=96:  XB%=225:  YB%=451:  XE%=286:  YE%=451:
GOSUB 630
10040    A5%=12: INT1%=24:  XB%=224:  YB%=452:  XE%=287:  YE%=452:
GOSUB 630
10050    A5%=12: INT1%=7:   XB%=218:  YB%=458:  XE%=293:  YE%=458:
GOSUB 630
10060    A5%=12: INT1%=96:  XB%=217:  YB%=459:  XE%=294:  YE%=459:
GOSUB 630
10070    A5%=12: INT1%=24:  XB%=216:  YB%=460:  XE%=295:  YE%=460:
GOSUB 630
10080    A5%=12: INT1%=7:   XB%=210:  YB%=466:  XE%=301:  YE%=466:
GOSUB 630
10090    A5%=12: INT1%=96:  XB%=209:  YB%=467:  XE%=302:  YE%=467:
GOSUB 630
11000    A5%=12: INT1%=24:  XB%=208:  YB%=468:  XE%=303:  YE%=468:
GOSUB 630
11010    A5%=12: INT1%=7:   XB%=202:  YB%=474:  XE%=309:  YE%=474:
GOSUB 630
11020    A5%=12: INT1%=96:  XB%=201:  YB%=475:  XE%=310:  YE%=475:
GOSUB 630
11030    A5%=12: INT1%=24:  XB%=200:  YB%=476:  XE%=311:  YE%=476:
GOSUB 630
11040    A5%=12: INT1%=7:   XB%=194:  YB%=482:  XE%=317:  YE%=482:
GOSUB 630
11050    A5%=12: INT1%=96:  XB%=193:  YB%=483:  XE%=318:  YE%=483:
GOSUB 630
11059    A5%=12: INT1%=24:  XB%=192:  YB%=484:  XE%=319:  YE%=484:
GOSUB 630
11060    A5%=3:  INT1%=24:  XB%=248:  YB%=248:  XE%=263:  YE%=263:
GOSUB 630
11061    RETURN
11062    '************************************************************
11070    A5%=3:  INT1%=7:   XB%=0:    YB%=0:    XE%=511:  YE%=256:
GOSUB 630
11080    A5%=3:  INT1%=96:  XB%=0:    YB%=256:  XE%=511:  YE%=511:
GOSUB 630
11090    A5%=3:  INT1%=24:  XB%=256:  YB%=128:  XE%=352:  YE%=256:
GOSUB 630
12000    A5%=3:  INT1%=16:  XB%=352:  YB%=128:  XE%=432:  YE%=256:
GOSUB 630
12010    A5%=12: INT1%=0:   XB%=256:  YB%=256:  XE%=296:  YE%=296:
GOSUB 630
12020    A5%=12: INT1%=0:   XB%=256:  YB%=255:  XE%=296:  YE%=295:
GOSUB 630
12030    A5%=12: INT1%=0:   XB%=256:  YB%=257:  XE%=296:  YE%=297:
```

FIG. 11L   LD.ASC

```
GOSUB 630
12040    A5%=12: INT1%=0:    XB%=296:  YB%=296:  XE%=392:  YE%=296:
GOSUB 630
12050    A5%=12: INT1%=0:    XB%=296:  YB%=295:  XE%=392:  YE%=295:
GOSUB 630
12060    A5%=12: INT1%=0:    XB%=296:  YB%=397:  XE%=392:  YE%=297:
GOSUB 630
12070    A5%=12: INT1%=0:    XB%=392:  YB%=296:  XE%=352:  YE%=256:
GOSUB 630
12080    A5%=12: INT1%=0:    XB%=392:  YB%=295:  XE%=352:  YE%=255:
GOSUB 630
12090    A5%=12: INT1%=0:    XB%=392:  YB%=297:  XE%=352:  YE%=257:
GOSUB 630
13000    A5%=12: INT1%=0:    XB%=256:  YB%=256:  XE%=352:  YE%=256:
GOSUB 630
13010    A5%=12: INT1%=0:    XB%=256:  YB%=255:  XE%=352:  YE%=255:
GOSUB 630
13020    A5%=12: INT1%=0:    XB%=256:  YB%=257:  XE%=352:  YE%=257:
GOSUB 630
13030    A5%=12: INT1%=0:    XB%=256:  YB%=128:  XE%=256:  YE%=256:
GOSUB 630
13040    A5%=12: INT1%=0:    XB%=256:  YB%=127:  XE%=256:  YE%=255:
GOSUB 630
13050    A5%=12: INT1%=0:    XB%=256:  YB%=129:  XE%=256:  YE%=257:
GOSUB 630
13060    A5%=12: INT1%=0:    XB%=256:  YB%=128:  XE%=432:  YE%=128:
GOSUB 630
13070    A5%=12: INT1%=0:    XB%=256:  YB%=127:  XE%=432:  YE%=127:
GOSUB 630
13080    A5%=12: INT1%=0:    XB%=256:  YB%=129:  XE%=432:  YE%=129:
GOSUB 630
13090    A5%=12: INT1%=0:    XB%=352:  YB%=128:  XE%=352:  YE%=256:
GOSUB 630
14000    A5%=12: INT1%=0:    XB%=352:  YB%=127:  XE%=352:  YE%=255:
GOSUB 630
14010    A5%=12: INT1%=0:    XB%=352:  YB%=129:  XE%=352:  YE%=257:
GOSUB 630
14020    A5%=12: INT1%=0:    XB%=392:  YB%=296:  XE%=432:  YE%=256:
GOSUB 630
14030    A5%=12: INT1%=0:    XB%=392:  YB%=295:  XE%=432:  YE%=255:
GOSUB 630
14040    A5%=12: INT1%=0:    XB%=392:  YB%=297:  XE%=432:  YE%=257:
GOSUB 630
14050    A5%=12: INT1%=0:    XB%=432:  YB%=256:  XE%=432:  YE%=128:
GOSUB 630
14060    A5%=12: INT1%=0:    XB%=432:  YB%=255:  XE%=432:  YE%=127:
GOSUB 630
14070    A5%=12: INT1%=0:    XB%=432:  YB%=257:  XE%=432:  YE%=129:
GOSUB 630
14080    A5%=12: INT1%=127: XB%=12:   YB%=480:  XE%=12:   YE%=496:
GOSUB 630
14090    A5%=12: INT1%=127: XB%=12:   YB%=496:  XE%=16:   YE%=500:
GOSUB 630
15000    A5%=12: INT1%=127: XB%=16:   YB%=500:  XE%=32:   YE%=500:
GOSUB 630
```

FIG. 11M   LD.ASC

```
15010    A5%=12:  INT1%=127:  XB%=32:   YB%=500:   XE%=36:    YE%=496:
GOSUB 630
15020    A5%=12:  INT1%=127:  XB%=36:   YB%=496:   XE%=36:    YE%=480:
GOSUB 630
15030    A5%=12:  INT1%=127:  XB%=36:   YB%=480:   XE%=32:    YE%=476:
GOSUB 630
15040    A5%=12:  INT1%=127:  XB%=32:   YB%=476:   XE%=16:    YE%=476:
GOSUB 630
15050    A5%=12:  INT1%=127:  XB%=16:   YB%=476:   XE%=12:    YE%=480:
GOSUB 630
15060    A5%=12:  INT1%=127:  XB%=6:    YB%=476:   XE%=12:    YE%=480:
GOSUB 630
15070    A5%=12:  INT1%=127:  XB%=6:    YB%=500:   XE%=12:    YE%=496:
GOSUB 630
15080    A5%=12:  INT1%=127:  XB%=12:   YB%=506:   XE%=16:    YE%=500:
GOSUB 630
15090    A5%=12:  INT1%=127:  XB%=36:   YB%=506:   XE%=32:    YE%=500:
GOSUB 630
16000    A5%=12:  INT1%=127:  XB%=42:   YB%=500:   XE%=36:    YE%=496:
GOSUB 630
16010    A5%=12:  INT1%=127:  XB%=36:   YB%=470:   XE%=32:    YE%=476:
GOSUB 630
16020    A5%=12:  INT1%=127:  XB%=12:   YB%=470:   XE%=16:    YE%=476:
GOSUB 630
16030    A5%=12:  INT1%=127:  XB%=42:   YB%=476:   XE%=36:    YE%=480:
GOSUB 630
16031    RETURN
16032    '**********************************************************
40000    END
```

FIG. 12A FTR.ASC

```
10      LPRINT "FTR2.ASC"          '8/15/84          REV.8/22/4    09:30"
20      'PREFILTER THE DATABASE IMAGE
30              OPEN "R", #1, "PRESENT.BIN",128
40              FIELD 1,128 AS IA$
50      'SET UP INTEGETER CONSTANTS FOR SPEED
60      K1=1/256
70      K2=1/8
80      K3=1/32
90      RC1=0    'INITIALIZE TO ZERO
100     F5%=66              'INPUT "NUMBER OF LINES TO BE
FILTERED";F5%
110 '   INPUT "ENABLE SMOOTHING PRINTOUTS; 'Y' OR 'N'"; A15$
120 '   INPUT "ENABLE STORING PRINTOUTS; 'Y' OR 'N'"; A16$
130 '   PRINT  "SELECT FIXED WEIGHTS"
140 '   INPUT  "  SELECT STANDARD WEIGHTS;  'Y' OR 'N'"; A1$
150 '   IF A1$ = "N" THEN 680
160 '   PRINT: PRINT
170 '   PRINT "    SELECT", "  1  ", "  2  ", "  3  ": PRINT
180 '   PRINT           , "2 4 2", "4 6 4", "8 8 8"
190 '   PRINT           , "4 8 4", "6 8 6", "8 8 8"
200 '   PRINT           , "2 4 2", "4 6 4", "8 8 8"
210     A1%=3    'PRINT: INPUT "SELECT WEIGHTS '1', '2', OR '3'";A1%
220     ON A1% GOTO 260, 290, 320
230     PRINT "**************************"
240     PRINT "IMPROPER WEIGHT SELECTION, MAKE ANOTHER SELECTION"
250     PRINT "**************************": PRINT: PRINT: PRINT:
GOTO 130
260     W1% = 2: W2% = 4: W3% = 2              'WEIGHT KERNEL 1
270     W4% = 4: W5% = 8: W6% = 4
280     W7% = 2: W8% = 4: W9% = 2: GOTO 390
290     W1% = 4: W2% = 6: W3% = 4              'WEIGHT KERNEL 2
300     W4% = 6: W5% = 8: W6% = 6
310     W7% = 4: W8% = 6: W9% = 4: GOTO 390
320     W1% = 8: W2% = 8: W3% = 8              'WEIGHT KERNEL 3
330     W4% = 8: W5% = 8: W6% = 8
340     W7% = 8: W8% = 8: W9% = 8: GOTO 390
350     PRINT: PRINT   "INPUT FIXED WEIGHTS"
360     INPUT  "INPUT WEIGHTS; W1, W2, W3"; W1%, W2%, W3%
370     INPUT  "INPUT WEIGHTS; W4, W5, W6"; W4%, W5%, W6%
380     INPUT  "INPUT WEIGHTS; W7, W8, W9"; W7%, W8%, W9%
390     WTS1%=W1%+W2%+W3%+W4%+W5%+W6%+W7%+W8%+W9%          'WEIGHT
SCALE FACTOR
400     WTS2=1/WTS1%                          'RECIPROCAL
WEIGHT SCALE FACTOR
410     PRINT: PRINT ," WEIGHTS SELECTED": PRINT
420     PRINT ,"W1=";W1%, "W2=";W2%, "W3=";W3%
430     PRINT ,"W4=";W4%, "W5=";W5%, "W6=";W6%
440     PRINT ,"W7=";W7%, "W8=";W8%, "W9=";W9%, "WTS1=";WTS1%: PRINT
450     WRR2% = 0: WRG2% = 0: WRB2% = 0: S1%=0: S2%=0
460     FOR KRLP1% = 1 TO F5%    'KERNEL ROW LOOP
465     IF KRLP1% > 1 THEN TST$="Y" ELSE TST$="N"
470     LPRINT "START KERNEL ROW=";KRLP1%
480     FOR KPLP1% = 1 TO 512    'KERNEL PIXEL LOOP
490     GOSUB 1820               'TERMINAL INPUT
500     XB% = KPLP1%: YB% = KRLP1%
```

FIG. 12B   FTR.ASC

```
510     XE% = XB% + 2: YE% = YB% + 2
520     X = (XB%/128)    'FIND PIXEL COORDINATE FOR RECORD LOCATION
530     BDC = XB%: IF BDC <=128 THEN 570
540     BDC = ABS(BDC-128)         'FIND BEGINNING DATA COUNT IN RECORD
550     'IF TST$ = "Y" THEN PRINT "PIXEL LOOP ";KPLP1%
560     IF BDC>128 THEN GOTO 540
570     FOR OUTLP1% = YB% TO YE%           'LINE LOOP
580     OUT 236,1
590     GOSUB 1820
600     GOSUB 2180         'DEFINE RECORD NO.
610     'IF TST$ = "Y" THEN PRINT "OUTLP1% ";OUTLP1%
620     'IF TST$ = "Y" THEN PRINT "RC ";RC
630     IF (RC >4) AND (RC < 261) THEN 640 ELSE 710
640     RC = RC-4         'SUBTRACT 4 SO LINES GO FROM 1-64
650     IF TOGL$="T" THEN 660 ELSE 860
660        CLOSE #1
670        OPEN "R",#1,"PRESENT.BIN",128 'REOPEN PRESENT FILE IF ANOTHER
680        FIELD 1,128 AS IA$     ' FILE WAS USED
690        TOGL$="F"
700     GOTO 860
710     IF RC < 5 THEN 720 ELSE 790
720     'GET RECORD FROM PREVIOUS FILE
730        CLOSE #1
740        OPEN "R",#1,"PRIOR.BIN",128
750        FIELD 1,128 AS IA$
760        TOGL$ = "T"    'FILE MUST BE OPEN FOR INNER LOOP
770        RC=252+RC        'SET RC TO LAST LINE IN PRIOR FILE
780        GOTO 860      'GET RECORD FROM FILE
790     'ELSE
800     'GET RECORD FROM NEXT FILE
810        CLOSE #1
820        OPEN "R",#1,"NEXT.BIN",128
830        FIELD 1,128 AS IA$
840        TOGL$ = "T"     'FILE MUST BE OPEN FOR INNER LOOP
850        RC=RC-260      'SET RC TO FIRST LINE IN NEXT ;FILE
860     GET #1,RC
870     FOR INLP1% = XB% TO XE% STEP 2  'PIXEL LOOP
880     OUT 236,1: OUT 236,0
890     '        CHECK FOR EVEN BYTE STARTING ADDRESS
900     IF A15$="Y" THEN GOSUB 1970
910        IF (INLP1% = XB% ) AND ((XB% MOD 2) = 0)   THEN DC=BDC-1
920        IF (INLP1% = XB% ) AND ((XB% MOD 2) <> 0) THEN DC = BDC
930        A$=MID$(IA$,DC,2) :' GET 2 BYTES
940 'X     IF CVI(A$) = 0 THEN K%=0: GOTO 1220
950        K% = CVI(A$)
960        PIXA% = K% AND 255 : ' GET FIRST BYTE
970        PIXB% = K% * K1 : 'GET SECOND BYTE
975        'IF TST$ = "Y" THEN PRINT "PIXA%, PIXB% ";PIXA%,PIXB%
980 'X  OUT 236,16: OUT 236,0
990     ' UNPACK RED, GREEN, AND BLUE INTENSITIES
1000    IF S1%=0 THEN 1010 ELSE 1020
1010    RDG2%=PIXB% AND 7: RDR2%=(PIXB% AND 24)*K2: RDB2%=(PIXB%
AND 96)*K3
1020    RDG1%=PIXA% AND 7: RDR1%=(PIXA% AND 24)*K2: RDB1%=(PIXA%
AND 96)*K3
```

FIG. 12C FTR.ASC

```
1030 'X OUT 236,16: OUT 236,0
1040     S3%=OUTLP1%-YB%+1: ON S3% GOTO 1060, 1070, 1080
1050            LPRINT "ERROR AT LINE 1610
1060              WS1%=W1%: WS2%=W2%: WS3%=W3%: GOTO 1090
1070              WS1%=W4%: WS2%=W5%: WS3%=W6%: GOTO 1090
1080              WS1%=W7%: WS2%=W8%: WS3%=W9%
1090 'X OUT 236,16: OUT 236,0
1100     IF S1%=0 THEN 1140
1110     WRR2% = RDR1%*WS3% + WRR2%
1120     WRG2% = RDG1%*WS3% + WRG2%
1130     WRB2% = RDB1%*WS3% + WRB2%:                GOTO 1170
1140     WRR2% = RDR1%*WS1% + RDR2%*WS2% + WRR2%
1150     WRG2% = RDG1%*WS1% + RDG2%*WS2% + WRG2%
1160     WRB2% = RDB1%*WS1% + RDB2%*WS2% + WRB2%: S1%=1
1170 'X OUT 236,16: OUT 236,0
1180     DC=DC+2: IF DC>=128 THEN 1190 ELSE 1200 'UPDATE DATA COUNT
1190     DC=1: RC=RC+1: GET #1,RC          'CONDITIONALLY UPDATE
RECORD COUNT
1200     NEXT INLP1%
1210     S1%=0
1220     NEXT OUTLP1%
1230     OUT 236,16
1240     IF S2%>0 THEN 1280
1250     S2%=1
1260     WRR1%=WRR2%*WTS2: WRG1%=WRG2%*WTS2: WRB1%=WRB2%*WTS2
1270     IF A15$="Y" THEN GOSUB 1270: GOTO 1310
1280     WRR2%=WRR2%*WTS2: WRG2%=WRG2%*WTS2: WRB2%=WRB2%*WTS2
1290     IF A15$="Y" THEN GOSUB 2000
1300     S2%=0: GOSUB 1410                   'STORE
1310     WRR2%=0: WRG2%=0: WRB2%=0
1320     OUT 236,0
1330     NEXT KPLP1%
1340     NEXT KRLP1%
1350'    CLOSE #1
1360'    OPEN "R",#2,"FILTERED.BIN",128
1370'    FIELD 2,128 AS IB$
1380'    PUT #2,RC1
1390     CLOSE
1400     SYSTEM
1410
'-----------------------------------------------------------------
1420     '
1430     '          CODE TO PUT NEW BYTES TO SPECIFIED WRITE FILE
1440     '             THE NEW BYTES SHOULD BE IN THE WRITE VARIABLES
1450     '
1460     '      CLOSE READ FILE AND OPEN WRITE FILE
1470     '
1480     '
1490     '     CALCULATIONS FOR EXACT PIXEL LOCATION
1500     XX=XB%:   YY=YB%
1510     X = (XX/128) : 'FIND PIXEL COORDINATE FOR RECORD LOCATION
1520     BDC = XX: IF BDC <=128 THEN 1550          'MODULO 128
1530     BDC = ABS(BDC-128)       :'FIND BEGINNING DATA COUNT IN RECORD
1540     IF BDC>128 THEN GOTO 1530
1550     DC2 =BDC
```

FIG. 12D   FTR.ASC

```
1560       OUTLP1%=YY
1570       GOSUB 2180        'GET RECORD NO.
1580       'RC0=RC
1590       'IF TST$ = "Y" THEN PRINT "RC1, RC0 ";RC1,RC0
1600       'IF RC1 = RC0 THEN 1710
1610       CLOSE #1
1620       OPEN "R",#2,"FILTERED.BIN",128
1630       FIELD 2,128 AS IB$
1640       'IF RC1=0 THEN 1660
1645        ' IB$=IB2$
1650         'PUT #2,RC1: 'PRINT "EXECUTED PUT ";CVI(IB$)
1660          GET #2,RC
1665       'IB2$=IB$
1670       'RC1 = RC0
1680    -  'CLOSE #2
1690       'OPEN "R",#1,"PRESENT.BIN",128
1700       'FIELD 1,128 AS IA$
1710        ' PACK RED, GREEN, BLUE COLORS INTO THEIR RESPECTIVE BYTES
1720               WR1% = WRG1% OR 8 * WRR1%
1730               WR1% = WR1% OR 32 * WRB1%
1740               WR2% = WRG2% OR 8 * WRR2%
1750               WR2% = WR2% OR 32 * WRB2%
1760       N3 = (WR2%*256) OR WR1%         ' PACK 2 BYTES INTO 1 WORD
1770         A$ = MKI$(N3)
1780          'PRINT "N3 ";N3
1790          MID$(IB$,DC2,2)=A$
1795          'PRINT "A$ ";CVI(A$)
1796         PUT #2,RC
1797       CLOSE #2
1798       OPEN "R",#1,"PRESENT.BIN",128
1799       FIELD 1,128 AS IA$
1800       RETURN
1810       '
1820

'*****************************************************************
1830       'SUBROUTINE TO INTERROGATE TERMINAL
1840       A7%=INP (93):  A8%=INP (92)
1850       A7%=A7% AND 2: IF A7%=0 THEN 1940        'DATA READY TEST
1860       A8%=A8% AND 127                          'MASK PARITY BIT
1870       A9%=A8% XOR 127: IF A9%=0 THEN 1930 ELSE 1940    'DELETE TO CP/M
1880       CLOSE #1
1890       OPEN "R",#2,"FILTERED.BIN",128
1900       FIELD 2,128 AS IB$
1910       PUT #2,RC1
1920       CLOSE
1930          SYSTEM
1940       RETURN
1950

'*****************************************************************
1960       '*******
1970       LPRINT: LPRINT: LPRINT "LINE 342": GOTO 2030
1980       '*******
1990       LPRINT: LPRINT: LPRINT "LINE 1265": GOTO 2030
2000       '*******
2010       LPRINT: LPRINT: LPRINT "LINE 2025": GOTO 2030
```

FIG. 12E FTR.ASC

```
2020     '*******
2030     LPRINT "KRLP1=";KRLP1%, "KPLP1=";KPLP1%,
"OUTLP1=";OUTLP1%, "INLP1="; INLP1%
2040     LPRINT "XB=";XB%, "YB=";YB%, "XE=";XE%, "YE=";YE%
2050     LPRINT "DC=";DC, "RC=";RC, "S1=";S1%, "S2=";S2%, "S3=";S3%
2060     LPRINT "RDG1=";RDG1%, "RDR1=";RDR1%, "RDB1=";RDB1%
2070     LPRINT "RDG2=";RDG2%, "RDR2=";RDR2%, "RDB2=";RDB2%
2080     LPRINT "WRG1=";WRG1%, "WRR1=";WRR1%, "WRB1=";WRB1%
2090     LPRINT "WRG2=";WRG2%, "WRR2=";WRR2%, "WRB2=";WRB2%
2100     LPRINT "WS1=";WS1%,    "WS2=";WS2%,    "WS3=";WS3%
2110     RETURN
2120
'**************************************************************
2130     LPRINT : LPRINT : LPRINT "LINE 236"
2140     LPRINT "W1=";W1%, "W2=";W2%, "W3=";W3%
2150     LPRINT "W4=";W4%, "W5=";W5%, "W6=";W6%
2160     LPRINT "W7=";W7%, "W8=";W8%, "W9=";W9% : RETURN
2170
'**************************************************************
2180                  'DEFINE RECORD NO.
2190        RC = ((OUTLP1%-1)*4)+1          '4-RECORDS/LINE, RECORD-
1 TO RECORD-4
2200        IF (X>1) AND (X<=2) THEN RC=RC+1  'CHECK FOR PIXEL
OVERFLOWING A RECORD
2210        IF (X>2) AND (X<=3) THEN RC=RC+2
2220        IF (X>3) THEN RC=RC+3
2230     RETURN
2240     END
```

FIG. 13A   DIS.ASC

```
200      PRINT: PRINT: PRINT "FILE: DIS.ASC, REV. 10/7/4  19:00"
220              'ADDED ANNOTATIONS AND DELETED UNNECESSARY MATERIAL
240      CLEAR
260      INPUT "MURPHY (M) OR CAMILLE (C)";K2$     'SELECT SYSTEM CONFIGURAT
280      PRINT: PRINT "JOYSTICK BIAS VALUES"      'CALIBRATE JOYSTICKS
300      E%=0
320      FOR A%=2 TO 8 STEP 2: B%=A%-2: OUT 236,B%: C%=INP (237): GOSUB 44
340      NEXT A%
360      IF K2$="C" THEN 400
380      A8%=INP (1): GOTO 420          'KEYBOARD EXIT OF
JOYSTICK CALIBRATE
400      A8%=INP (93)
420      A8%=A8% AND 2: IF A8%=0 THEN 320 ELSE 660
440      '************************************************************
460      'SUBROUTINE TO ACQUIRE JOYSTICK VALUES
480      D%=A%/2: ON D% GOTO 500,520,540,580
500              PRINT "SCALE=";C%,: BS5%=C%: GOTO 620
520              PRINT "X="    ;C%,: BX5%=C%: GOTO 620
540              PRINT "ANGLE=";C%,: BA5%=C%: GOTO 620
580              PRINT "Y="    ;C% : BY5%=C%
600              PRINT CHR$(11);
620      RETURN
640      '************************************************************
660  '   PRINT: PR1%=1: PR2%=1: PR5%=128: DB1%=15
680      PR7$="N"         'INPUT "PRINTOUT? 'Y' OR 'N'";PR7$
700      PR9$="Y"         'INPUT "UPDATE EACH FIELD, NOT ALTERNATE
FIELDS; 'Y' OR 'N'";PR9$
720      PR10$="Y"        'INPUT "CLEAR REMAINDERS;  'Y' OR 'N'"; PR10$
740      PR11$="Y"        'INPUT "SLOPE USING CINT ROUNDOFF; 'Y' OR 'N'";PR
760      INPUT "SCALE FACTOR; MIN, MAX; .1 TO 1500; 10,600 IS
NOMINAL";PR12,PR13
780          IF PR12=0 OR PR13=0 THEN 800 ELSE 820
800              PR12=10: PR13=600
820      IF PR9$="Y" GOTO 860     'INTERPOLATE ONCE EACH FIELD OR
ONCE EACH FRAME
840              TS1=1/4: GOTO 880          'NUMBER OF TIME SLICES
860              TS1=1/8
880      INPUT "NEW WINDOW GEOMETRY: 'Y' OR 'N'";PR32$
900      PR16$="F"        'INPUT "INTEGER (I) OR NON-INTEGER (F)
TRANSLATION";PR16$
920      IF PR32$="Y" GOTO 960
940      PRINT: INPUT "OFFSET CENTER OF ROTATION: TX,TY";TX,TY: GOTO 980
960      PRINT: INPUT "OFFSET CENTER OF IMAGE: X1, Y1"  ;X1,Y1
980      DB1%=20          'PRINT: INPUT "DEADBAND SELECTION; 20 IS NOMINAL";DB
1000     PR21$="Y"        'PRINT: INPUT "FRACTIONAL INITIAL POINT AND
SLOPES, Y OR N";PR21$
1020     DR=.017453292#: RD=57.29577951000028#
1040     X5V=512: Y5V=482          'VIEWPORT DIMENSIONS
1060     '** ADAPT X5V FOR PIXEL RATE; (54 US)(9.15 MHZ)(16/18 CLOCK WIDTH
1080     X5I=512: Y5I=512          'IMAGE MEMORY DIMENSIONS IN PIXELS
1100 'A  R1=SQR(X5V^2+Y5V^2)       'UNITS OF PIXELS
1120 'A  AP1=ATN(Y5V/X5V)
1140 'A  A6=ATN(X5V/Y5V): AP1=90*DR-A6
1160     KS1%=X5I*8: KS2%=Y5I*8  'IMAGE MEMORY DIMENSIONS IN
EIGHTH PIXELS
```

FIG. 13B DIS.ASC

```
1180    Q2=(Y5V/2)-TY: Q3=(X5V/2)+TX
1200    IF PR32$="Y" GOTO 1260
1220    AP1=ATN(Q2/Q3): R1=2*SQR(Q2^2+Q3^2)
1240    KB1=R1*8*SIN(AP1)/2: KB2=R1*8*COS(AP1)/2: GOTO 1280
1260    KB1=Q2*8: KB2=Q3*8
1280    DS11=1: JSS%=128
1300    XC1=(X5I/2+X1)*8: YC1=(Y5I/2+Y1)*8: TX=TX*8: TY=TY*8
1320    F6%=1: F7%=0
1340    XSV=1.58             'VIEWPORT ASPECT RATIO
1360    IF PR32$="Y" GOTO 1420
1380    XS=256*XSV : YS=256: YSS=YS*(3.90625E-03):
XSVR=1/(XSV*256)
1400    KSAR=0: KCAR=1: XSSV=XS*XSVR: GOTO 1460
1420    XS=256*XSV : YS=256: YSS=1
1440    KSAR=0: KCAR=1: XSSV=1
1460    FOR E%=1 TO 16: GOSUB 2220: NEXT E%        'INITIAL
CONDITION GENERATION
1480    R%=INP (236): S%=R% AND 1: IF S%=1 THEN 1480       'LOCKUP
ON VERT.SYNC=1
1500    R%=INP (236): S%=R% AND 16: IF S%=0 THEN 1480     'CHECK FIELD
1520    'ITERATIVE PROCESSING
1540    OUT 236,64
1560    'RESYNCHRONIZATION AND FIELD CONTROL PROCESSOR
1580    R%=INP (236): S%=R% AND 1
1600    IF S%=0 THEN 1580            'LOCKUP ON VERT.SYNC=0
1620            'INTERLACED SCAN CALCULATIONS
1640            'INPUT BYTE    128 064 032 016 008 004 002 001
1660            '                  F2      F1      LS      FS
1680    OUT 236,0                        'COMMAND LOAD, RUN-BAR
1700    R%=INP (236): S%=R% AND 16: IF S%=0 THEN 1860 ELSE 1720
'CHECK FIELD
1720                    'FIELD-2
1740        'OUTPUT  POSITION PARAMETERS
1760        OUT 238, 249: OUT 237, CA2%: OUT 236,128: OUT 236,0 'Y-ROW MS]
1780        OUT 238, 250: OUT 237, CB2%: OUT 236,128: OUT 236,0 'Y-ROW LS]
1800        OUT 238, 246: OUT 237, CC2%: OUT 236,128: OUT 236,0 'X-ROW MS]
1820        OUT 238, 247: OUT 237, CD2%: OUT 236,128: OUT 236,0 'X-ROW LS]
1840    GOTO 1980
1860                    'FIELD-1
1880        'OUTPUT  POSITION PARAMETERS
1900        OUT 238, 249: OUT 237, CA1%: OUT 236,128: OUT 236,0 'Y-ROW MS]
1920        OUT 238, 250: OUT 237, CB1%: OUT 236,128: OUT 236,0 'Y-ROW LS]
1940        OUT 238, 246: OUT 237, CC1%: OUT 236,128: OUT 236,0 'X-ROW MS]
1960        OUT 238, 247: OUT 237, CD1%: OUT 236,128: OUT 236,0 'X-ROW LS]
1980        'OUTPUT SLOPE PARAMETERS
2000        OUT 238,242: OUT 237,XPM%: OUT 236,128: OUT 236,0
'X-PIXEL SLOPE MSH
2020        OUT 238,245: OUT 237,YPM%: OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE MSH
2040        OUT 238,248: OUT 237,XRM%: OUT 236,128: OUT 236,0
'X-ROW SLOPE MSH
2060        OUT 238,251: OUT 237,YRM%: OUT 236,128: OUT 236,0
'Y-ROW SLOPE MSH
2080        OUT 238,243: OUT 237,XPL%: OUT 236,128: OUT 236,0
'X-PIXEL SLOPE LSH
```

```
2100          OUT 238,244: OUT 237,YPL%:  OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE LSH
2120          OUT 238,240: OUT 237,XRL%:  OUT 236,128: OUT 236,0
'X-ROW SLOPE LSH
2140          OUT 238,241: OUT 237,YRL%:  OUT 236,128: OUT 236,0
'Y-ROW SLOPE LSH
2160     OUT 236,80   'COMMAND RUN, LOAD-BAR ;PULSE-1 BRACKETING
COMPUTATION PERIOD
2180     GOSUB 2220                'PROCESSING FOLLOWS OUTPUT
2200     GOTO 1520                 'LOOP BACK FOR NEXT FIELD
2220 '******SUBROUTINE FOR INTERFIELD PROCESSING
2240     F6%=F6%+1         'INCREMENT TIME SLICE COUNTER
2260     ON F6% GOTO 4000, 4640, 4800, 2280, 2820, 3360, 3440,
3540
2280 '*******************************************************
2300     GOSUB 5220: GOSUB 5840  'INTERPOLATE
2320     'CALCULATE INITIAL POINT
2340      XIP1N%=XC1+TX-KF6-KF4      'EQUIVALENT TO XIP1N%=XC1-
R1*8*COS(A5%)/2
2360 '          IF XIP1N%<0 THEN 5180 ELSE 5220
2380 '                    XIP1N%=XIP1N%+KS1%: GOTO 5300    'WRAP AROUND
2400 '          IF XIP1N%>KS1% THEN 5260 ELSE 5300
2420 '                    XIP1N%=XIP1N%-KS1%
2440     YIP1N%=YC1+TY+KF7-KF5 'EQUIVALENT TO YPI1%=YC1-R1*8*SIN(A5%)/2
2460 '          IF YIP1N%<0 THEN 5380 ELSE 5420
2480 '                    YIP1N%=YIP1N%+KS2%: GOTO 5500    'WRAP-AROUND
2500 '          IF YIP1N%>KS2% THEN 5460 ELSE 5500
2520 '                    YIP1N%=YIP1N%-KS2%
2540 '   XIP1N%=XIP1N%-XRN%  'BUFFER MEMORY WITH ANTI-ALIASING
2560 '   YIP1N%=YIP1N%-YRN%
2580     XIP2N%=XIP1N%+XRN%*(.015625)    'XIP1-SF=8, XR%-SF=256;
1/2*(8/256)=1/64
2600     YIP2N%=YIP1N%+YRN%*(.015625)
2620     'JOYSTICK PROCESSOR; MUST OCCUR MORE THAN 100-
MICROSECONDS AFTER FRAME SYNC GOES LOW
2640     OUT 236,66: JSXV%=INP (237): OUT 236,68: JSA%=INP (237)
2660     OUT 236,70: JSYV%=INP (237): OUT 236,64: JSS%=INP (237): OUT 236,
2680     JSXB%=JSXV%-BX5%: JSYB%=JSYV%-BY5%:  JSSB%=JSS%-BS5%:
JSAB%=JSA%-BA5%
2700     IF ABS(JSAB%)<DB1% THEN 2800          'CHECK IF IN DEADBAND
2720         IF JSAB%<0 THEN 2740 ELSE 2760    'BIAS OUT DEADBAND
2740            JSAB%=JSAB%+DB1%: GOTO 2780
2760            JSAB%=JSAB%-DB1%
2780     AR=AR+JSAB%*ABS(JSAB%)*(.00003)       'SQUARE LAW JOY
STICK SCALING
2800     RETURN
2820     '*********************************************************
2840     IF PR9$="N" GOTO 2880
2860            GOSUB 5220: GOSUB 5840  'INTERPOLATION
2880     GOSUB 4980                 'KEYBOARD INPUT ROUTINE
2900     IF PR10$="N" THEN 2960
2920            SDXIP1R%=0: SDYIP1R%=0: SDXIP2R%=0: SDYIP2R%=0
2940            SDXPR%=0:   SDYPR%=0:   SDXRR%=0:   SDYRR%=0
2960     DXIP1%=(XIP1N%-XIP1P%): DYIP1%=(YIP1N%-YIP1P%)
2980     DXIP2%=(XIP2N%-XIP2P%): DYIP2%=(YIP2N%-YIP2P%)
```

FIG. 13D   DIS.ASC

```
3000    DYP%=(YPN%-YPP%):        DXP%=(XPN%-XPP%)
3020    DYR%=(YRN%-YRP%):        DXR%=(XRN%-XRP%)
3040    'REMAINDER PROCESSING WORKS FOR + AND - DELTA NUMBERS
3060    IF PR9$="Y" GOTO 3180
3080    DXIP1R%=DXIP1% AND 3:    DYIP1R%=DYIP1% AND 3
3100    DXIP2R%=DXIP2% AND 3:    DYIP2R%=DYIP2% AND 3
3120    DXPR%=DXP% AND 3:        DYPR%=DYP% AND 3
3140    DXRR%=DXR% AND 3:        DYRR%=DYR% AND 3
3160    GOTO 3260
3180    DXIP1R%=DXIP1% AND 7:    DYIP1R%=DYIP1% AND 7
3200    DXIP2R%=DXIP2% AND 7:    DYIP2R%=DYIP2% AND 7
3220    DXPR%=DXP% AND 7:        DYPR%=DYP% AND 7
3240    DXRR%=DXR% AND 7:        DYRR%=DYR% AND 7
3260    DXIP1%=DXIP1%*TS1:       DYIP1%=DYIP1%*TS1
3280    DXIP2%=DXIP2%*TS1:       DYIP2%=DYIP2%*TS1
3300    DXP%=DXP%*TS1:           DYP%=DYP%*TS1
3320    DXR%=DXR%*TS1:           DYR%=DYR%*TS1
3340    RETURN
3360    '***********************************************************
3380    GOSUB 5220: GOSUB 5840   'INTERPOLATE
3400    KSAR=SIN(AR)
3420    RETURN
3440    '***********************************************************
3460    IF PR9$="N" GOTO 3500
3480            GOSUB 5220: GOSUB 5840    'INTERPOLATE
3500    KCAR=COS(AR)
3520    RETURN
3540    '***********************************************************
3560    F6%=0                    'RESET TIME SLICE COUNTER
3580    GOSUB 5220: GOSUB 5840   'INTERPOLATE, FIRST OPERATION IN
PRIOR TIME SLICE
3600    JSYK%=JSYB%*KSAR: JSXK%=JSXB%*KSAR
3620    JSXB%=JSXB%*KCAR+JSYK%: JSYB%=JSYB%*KCAR-JSXK%
3640    'UPDATE POSITION; PRECEEDS XIP, YIP PROCESSING
3660    IF ABS(JSXB%)<DB1% THEN 3980
3680 '          IF XC1>30000 AND JSXB%<0 THEN 7420       'LIMIT X-
TRANSLATION, SCROLLING
3700 '          IF XC1<-30000 AND JSXB%>0 THEN 7420
3720            IF XC1>30000 THEN 3740 ELSE 3760         'LIMIT X-
TRANSLATION, WRAP-AROUND
3740                XC1=XC1-32760: GOTO 3800
'(512*8)PIXELS*8 SUBPIXELS-8 SUBPIXELS
3760            IF XC1<-30000 THEN 3780 ELSE 3800
3780                XC1=XC1+32760
3800            IF JSXB%<0 THEN 3820 ELSE 3840           'BIAS OUT DEADBAND
3820                JSXB%=JSXB%+DB1%: GOTO 3860
3840                JSXB%=JSXB%-DB1%
3860            IF PR16$="F" THEN 3960
3880                DX1=DXR1+JSXB%*ABS(JSXB%)*(.075)
3900                DXI1=FIX(DX1)
3920                DXR1=DX1-DXI1
3940                XC1=XC1-DXI1: GOTO 3980
3960                XC1=XC1-JSXB%*ABS(JSXB%)*(.075)
3980    RETURN
4000    '***********************************************************
```

FIG. 13E DIS.ASC

```
4020    OUT 236,65        'OUTPUT START PULSE, INCREMENT TIME SLICE COUNTER
4040    IF PR9$="N" GOTO 4080
4060            GOSUB 5220: GOSUB 5840   'INTERPOLATE
4080    IF ABS(JSYB%)<DB1% THEN 4400
4100 '          IF YC1>30000 AND JSYB%>0 THEN 7740      'LIMIT Y-
TRANSLATION, SCROLLING
4120 '          IF YC1<-30000 AND JSYB%<0 THEN 7740
4140            IF YC1>30000 THEN 4160 ELSE 4180        'LIMIT X-
TRANSLATION, WRAP-AROUND
4160                    YC1=YC1-32760: GOTO 4220
4180            IF YC1<-30000 THEN 4200 ELSE 4220
4200            YC1=YC1+32760
4220            IF JSYB%<0 THEN 4240 ELSE 4260          'BIAS OUT DEADBAND
4240                    JSYB%=JSYB%+DB1%: GOTO 4280
4260                    JSYB%=JSYB%-DB1%
4280            IF PR16$="F" THEN 4380
4300                    DY1=DYR1+JSYB%*ABS(JSYB%)*(.075)
4320                    DYI1=FIX(DY1)
4340                    DYR1=DY1-DYI1
4360                    YC1=YC1-DYI1: GOTO 4400
4380                    YC1=YC1+JSYB%*ABS(JSYB%)*(.075)
4400    IF ABS(JSSB%)<DB1% THEN 4620
4420            IF JSSB%<0 THEN 4440 ELSE 4460
4440                    JSSB%=JSSB%+DB1%: GOTO 4480      'BIAS OUT DEADBAND
4460                    JSSB%=JSSB%-DB1%
4480            DS11=1+JSSB%*ABS(JSSB%)*(.00001)        'OFFSET
BINARY TO SIGN BINARY, SCALE, BIAS ABOUT UNITY
4500    IF DS11<1 AND XS<PR12  OR DS11<1 AND YS<PR12  THEN 4620
4520    IF DS11>1 AND XS>PR13 OR DS11>1 AND YS>PR13 THEN 4620
4540      XS=XS*DS11: YS=YS*DS11
4560    IF PR32$="Y" GOTO 4600
4580    YSS=YS*(3.90625E-03): XSSV=XS*XSVR: GOTO 4620
4600    KB1=KB1*DS11: KB2=KB2*DS11
4620    RETURN
4640    '***********************************************************
4660    GOSUB 5220: GOSUB 5840   'INTERPOLATE, CALCULATIONS
PERFORMED IN PRIOR TIME-SLICE
4680    IF PR32$="Y" GOTO 4740
4700    KF6=KB2*KCAR*XSSV: KF7=KB1*KCAR*YSS
4720    KF4=KB1*KSAR*XSSV: KF5=KB2*KSAR*YSS: GOTO 4780
4740    KF6=KB2*KCAR: KF7=KB1*KCAR
4760    KF4=KB1*KSAR: KF5=KB2*KSAR
4780    RETURN
4800    '***********************************************************
4820    IF PR9$="N" GOTO 4860
4840            GOSUB 5220: GOSUB 5840                  'INTERPOLATE
4860    IF PR11$="N" THEN 4920
4880    YPN%=CINT(KSAR*XS):     XRN%=CINT(2*KSAR*YS)
'CALCULATE SLOPES
4900    YRN%=-CINT(2*KCAR*YS): XPN%=CINT(KCAR*XS): GOTO 4960
4920    YPN%=KSAR*XS:      XRN%=2*KSAR*YS           'CALCULATE SLOPES
4940    YRN%=-2*KCAR*YS: XPN%=KCAR*XS
4960    RETURN
4980    '***********************************************************
5000    IF K2$="C" THEN 5040                'KEYBOARD COMMANDS
```

FIG. 13F   DIS.ASC

```
5020    A7%=INP (1): A8%=INP (0): GOTO 5060
5040    A7%=INP (93):  A8%=INP (92)
5060    A7%=A7% AND 2: IF A7%=0 THEN 5200        'DATA READY TEST
5080    A8%=A8% AND 127                          'MASK PARITY BIT
5100    A9%=A8% XOR 27: IF A9%=0 THEN 240        'ESCAPE TO MENU
5120    A9%=A8% XOR 74: IF A9%=0 THEN 5140 ELSE 5160    '"J" TO
RECALIBRATE JOYSTICKS
5140        BS5%=JSS%: BX5%=JSXV%: BY5%=JSYV%: BA5%=JSA%: GOTO
5200
5160    A9%=A8% XOR 127: IF A9%=0 THEN 5180 ELSE 5200   'DELETE TO CP/M
5180        SYSTEM
5200    RETURN
5220    '***********************************************
5240    'INTERPOLATION SUBROUTINE-1
5260    'UPDATE INITIAL POSITIONS AND SLOPES
5280    'REMAINDER PROCESSING
5300    SDXIP1R%=SDXIP1R%+DXIP1R%:  SDYIP1R%=SDYIP1R%+DYIP1R%
5320    SDXIP2R%=SDXIP2R%+DXIP2R%:  SDYIP2R%=SDYIP2R%+DYIP2R%
5340    SDXPR%=SDXPR%+DXPR%:        SDYPR%=SDYPR%+DYPR%
5360    SDXRR%=SDXRR%+DXRR%:        SDYRR%=SDYRR%+DYRR%
5380    'INTERPOLATION DELTA UPDATES
5400    XIP1P%=XIP1P%+DXIP1%: YIP1P%=YIP1P%+DYIP1%
5420    XIP2P%=XIP2P%+DXIP2%: YIP2P%=YIP2P%+DYIP2%
5440    XPP%=XPP%+DXP%:          YPP%=YPP%+DYP%
5460    XRP%=XRP%+DXR%:          YRP%=YRP%+DYR%
5480    IF SDXIP1R%<8 THEN 5520
5500        SDXIP1R%=SDXIP1R%-8: XIP1P%=XIP1P%+1
5520    IF SDYIP1R%<8 THEN 5560
5540        SDYIP1R%=SDYIP1R%-8: YIP1P%=YIP1P%+1
5560    IF SDXIP2R%<8 THEN 5600
5580        SDXIP2R%=SDXIP2R%-8: XIP2P%=XIP2P%+1
5600    IF SDYIP2R%<8 THEN 5640
5620        SDYIP2R%=SDYIP2R%-8: YIP2P%=YIP2P%+1
5640    IF SDXPR%<8 THEN 5680
5660        SDXPR%=SDXPR%-8: XPP%=XPP%+1
5680    IF SDYPR%<8 THEN 5720
5700        SDYPR%=SDYPR%-8: YPP%=YPP%+1
5720    IF SDXRR%<8 THEN 5760
5740        SDXRR%=SDXRR%-8: XRP%=XRP%+1
5760    IF SDYRR%<8 THEN 5800
5780        SDYRR%=SDYRR%-8: YRP%=YRP%+1
5800    '
5820    RETURN
5840    '*************************************************************
5850    'INTERPOLATION SUBROUTINE-2
5860    'FORMAT INITIAL POINT OUTPUTS
5880    IF PR21$="N" THEN 6020
5900    CA1%=YIP1P%*(.015625): CB1%=YIP1P% AND 63:
CC1%=XIP1P%*(.015625): CD1%=XIP1P% AND 63
5920    CA2%=YIP2P%*(.015625): CB2%=YIP2P% AND 63:
CC2%=XIP2P%*(.015625): CD2%=XIP2P% AND 63
5940    'FORMAT SLOPE OUTPUTS
5960    XPM%=XPP%*(.015625): XPL%=XPP% AND 63:
YPM%=YPP%*(.015625): YPL%=YPP% AND 63
5980    XRM%=XRP%*(.015625): XRL%=XRP% AND 63:
```

FIG. 13G   DIS.ASC

```
       YRM%=YRP%*(.015625): YRL%=YRP% AND 63
6000      GOTO 6140
6020      'FORMAT IP AND SLOPE AND TRUNCATE TO PIXEL RESOLUTION
6040      CA1%=YIP1P%*(.015625): CB1%=YIP1P% AND 56:
       CC1%=XIP1P%*(.015625): CD1%=XIP1P% AND 56
6060      CA2%=YIP2P%*(.015625): CB2%=YIP2P% AND 56:
       CC2%=XIP2P%*(.015625): CD2%=XIP2P% AND 56
6080      XPM%=XPP%*(.015625) AND 60: XPL%=XPP% AND 0:
       YPM%=YPP%*(.015625) AND 60: YPL%=YPP% AND 0
6100      XRM%=XRP%*(.015625) AND 60: XRL%=XRP% AND 0:
       YRM%=YRP%*(.015625) AND 60: YRL%=YRP% AND 0
6120    '
6140      RETURN
6160    '***********************************************************
6180      END
```